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EXAMINER
KENEDY, ANDREW A

ART UNIT	PAPER NUMBER
1631	

DATE MAILED: 08/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

		Application No.	Applicant(s)
Office Action Summary		09/851,674	VAIDYANATHAN ET AL.
		Examiner	Art Unit	
		Andrew A. Kenedy	1631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-67* is/are pending in the application.

    4a) Of the above claim(s) *1-34 and 54-65* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *35-53,66 and 67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-67* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 May 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
    Paper No(s)/Mail Date *3/5/02 and 12/2/02*.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____ .

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of Group V (Claims 35-53 and 66-67) in the reply

filed on July 6, 2004, is acknowledged.

Claims 1-34 and 54-65 are withdrawn from further consideration pursuant to 37 CFR

1.142(b) as being drawn to nonelected inventions, there being no allowable generic or linking

claim. Election was made **without** traverse in the reply filed on July 6, 2004.

Claims 1-67 are currently pending.

Oath/Declaration

Applicant apparently submitted a Declaration on September 14, 2001, as indicated in a

letter of *Response to Notice to File Missing Parts of Application* of the same date. However, the

Declaration is currently missing from the file. The Examiner kindly requests that Applicants

submit a copy of the Declaration in response to this Office Action in order to complete the file.

Drawings

New corrected drawings are required in this application because the alphanumeric

content of the shaded ovals in Figure 7 is not legible. Applicant is advised to employ the services

of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office

no longer prepares new drawings. The corrected drawings are required in reply to the Office

action to avoid abandonment of the application. The requirement for corrected drawings will not

be held in abeyance.

Claim Objections

The following claims are objected to because of the following informalities:

Step (i) of Claim 35 contains the phrase "the first, primary, column comprising" and the phrase "the first, primary, sequence". The punctuation indicates a series of entities, but it appears that the comma following the term "primary" in each instance is a typographical error and that the phrase should instead be "the first, primary column comprising" and the phrase "the first, primary sequence".

Step (ii) of Claim 35 contains the phrase "where the difference-in-position value are the position differences". It appears that the phrase "value are" is a grammatical misspelling of the phrase "values are".

The preamble of Claim 43 contains the phrase "with one addition sequence", which appears to be a grammatical misspelling of the phrase "with one additional sequence".

Claim 53, step (i) requires "adding a pointer **to** the pattern **to** the current T-node pattern array", which appears to be a grammatical misspelling of either the phrase "adding a pointer **from** the pattern **to** the current T-node pattern array" or the phrase "adding a pointer **to** the pattern **of** the current T-node pattern array".

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 35-53 and 66-67 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

The methods of Claims 35-53, which are methods for discovering one or more patterns in a set of k sequences of symbols or methods of forming a (k+1)-tuple table, appear to be methods drawn entirely to data manipulation since they do not clearly require any steps involving physical manipulation, and since they do not produce results that are concrete, tangible and useful. A claimed process that only involves data manipulation without producing a concrete, tangible and useful result constitutes non-statutory subject matter. See MPEP § 706.03(a) and § 2106.

The computer-readable medium containing a data structure as in Claims 66 and 67 is non-statutory subject matter since the data structure cannot be executed to impart a functional change in a computer. Therefore, the data structure constitutes descriptive material that is nonfunctional and thus non-statutory. The fact that the data structure is contained in a computer-readable medium does not make it statutory subject matter. MPEP § 2106(IV)(B)(1) states:

> "When nonfunctional descriptive material is recorded on some computer-readable medium, it is not statutory since no requisite functionality is present to satisfy the practical application requirement. Merely claiming nonfunctional descriptive material stored in a computer-readable medium does not make it statutory."

Claim Rejections - 35 USC § 112

Claims 35-53 and 66-67 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 35, step (b) requires "for each sequence, grouping the (symbol, position index) pairs by symbol to form a respective master offset table, thus creating w master offset tables". It

is unclear how w master offset tables can be created since the preamble states that the method is

for discovering patterns in a set of k sequences of symbols, and step (a) of the method requires

translating only *the sequences of symbols* into (symbol, position index) pairs. Only the k

sequences of symbols are referred to specifically as *sequences of symbols*, so that step (a) of the

method as claimed requires processing of only the k sequences of symbols, and not the overall

set of w sequences, into (symbol, position index) pairs. Therefore, it would appear that only k

master offset tables could be created in step (b) using the (symbol, position index) pairs obtained

in step (a) from the k sequences of symbols.

Claim 35, step (b) requires "creating w master offset tables". It is unclear why w master

offset tables are created since master offset tables are not required for use by any subsequent step

of the method as claimed.

Claim 35, step (c) requires "forming a k-tuple table associated with the k-tuple, the table

comprising k, each column corresponding to one of the k sequences". The requirement of the

table comprising k is confusing, since k is simply a single numeral representing the total number

of sequences forming the tuple. It appears that Applicants may have instead intended "the table

comprising the k sequences of symbols", or "the table comprising k columns", or "the table

comprising k suffix columns".

Claim 35, step (ii) recites the limitation "the subsequent (k-1) suffix columns". There is

insufficient antecedent basis for this limitation in the claim, since the terminology "suffix

columns" does not appear previously in the claim.

Claim 35, step (ii) recites the limitation "between all possible like symbols of each

remaining sequence", and step (iii) recites the limitation "like symbols". First, the identities of

the symbols of each of the k sequences of symbols are fixed and definite, so it is confusing as to

what Applicants mean by the term "possible", as if referring to probability or a choice when there

appears to be none. It is also unclear whether Applicants use the term "like" to mean similar, or

to mean same/identical, since no definition is disclosed in the instant specification.

Claim 35, step (ii) requires the *difference-in-position value* of the (symbol, difference-in-

position value) pair for a particular symbol to be the position differences between all possible

like symbols of a remaining sequence of the tuple and the primary sequence of the tuple. It is

unclear how the single *difference-in-position value* field of the (symbol, difference-in-position

value) pair can hold all of the position differences for all like symbols, particularly if the

corresponding like symbols happen to be the same identical symbol.

Claim 35, step (d) requires creating a sorted k-tuple table using "the difference-in-

position value of the last suffix column (k^{th} column) through the difference-in-position value of

the first suffix column (2nd column)". This is confusing since each suffix column will comprise

multiple (symbol, difference-in-position value) pairs, and thus multiple difference-in-position

values are present in a suffix column, when a pattern is shared with the primary sequence. It is

then unclear which of the multiple difference-in-position values of a particular suffix column

will be used for the required sorting, since only a single difference-in-position value is specified

as being required for sorting according to this method step as claimed.

Claim 35, step (e) requires "collecting adjacent rows of the sorted k-tuple table whose

suffix columns contain identical sets of difference-in-position values". It is unclear what the

rows are collected into (e.g., a table or matrix) and if the collection is organized in any way. It is

also unclear whether all or only a subset of the suffix columns are required to contain identical

sets of difference-in-position values.

Claim 35, step (e) recites the limitation "sets of difference-in-position values". There is

insufficient antecedent basis for this limitation in the claim, since the terminology "sets of

difference-in-position values" does not appear previously in the claim. Furthermore, no previous

step of the method explicitly creates sets of difference-in-position values.

Claim 36 requires "deleting all patterns not satisfying a predetermined criteria". The

terminology "a predetermined criteria" is indefinite as to the type of criteria (e.g., pattern length,

pattern symbol composition, subjective user preferences, etc.) encompassed by the limitation,

thereby rendering the scope of the claim uncertain.

Claim 40 requires "deleting rows from the k-tuple table according to predetermined

criteria". The terminology "predetermined criteria" is indefinite as to the type of criteria (e.g.,

pattern length, pattern symbol composition, subjective user preferences, etc.) encompassed by

the limitation, thereby rendering the scope of the claim uncertain.

Claim 41 requires the deletion of rows from the k-tuple table. It is unclear whether all of

the rows or just some rows are to be deleted. If only some of the rows are to be deleted, then it is

unclear which particular rows should be deleted from the k-tuple table.

Claim 42, step (a) recites the limitation "the sequence of symbols". There is insufficient

antecedent basis for this limitation in the claim, since the terminology "sequence of symbols"

does not appear previously in the claim, and there is no preceding step in the method in which a

sequence of symbols was obtained.

Claim 42, step (a) requires the limitation "the location of the symbol in a sequence". It is unclear whether "a sequence" in this context refers to "the sequence of symbols" which appears previously in the same step, to "a sequence" as mentioned in the preamble, or to some other sequence.

Claim 42, step (b) requires "grouping the (symbol, difference-in-position value) pairs by symbol to form a respective master offset table". It is unclear what Applicants mean by "respective". More specifically, it is unclear what the master offset table is formed in respect to.

Claim 42, step (i) recites the limitation "the primary column of the k-tuple table". There is insufficient antecedent basis for this limitation in the claim, since the terminology "primary column" does not appear previously in the claim, and there is no preceding step in the claim in which a "primary column" was obtained or designated.

Claim 42, step (i) requires "forming all combinations of like symbols between the primary column of the k-tuple table and the master offset table". It is unclear what the composition of the k-tuple table is and at which step it was obtained, since there does not appear any previous step for obtaining a k-tuple table and the content of the k-tuple table is not indicated.

Claim 42, step (i) requires "like symbols". It is unclear whether Applicants use the term "like" to mean similar, or to mean same/identical, since no definition is disclosed in the instant specification.

Claim 43, step (b) requires "deleting rows from the k-tuple table whose suffix columns contain identical sets of difference-in-position values". It is unclear which whether all the rows

or only a subset of rows are deleted. It is also unclear whether all or only a subset of the suffix

columns are required to contain identical sets of difference-in-position values.

Claim 44, step (A) requires "like symbols". It is unclear whether Applicants use the term

"like" to mean similar, or to mean same/identical, since no definition is disclosed in the instant

specification.

Claim 44, step (B) requires "repeatedly storing each (symbol. position index) pair from

the first master offset table in a row of the Pattern Map". It is confusing why each pair must be

repeatedly stored, since once a pair is stored it is not necessary to create a duplicate entry in the

Pattern Map for that same pair.

Claim 44, step (v) requires "repeating step d) for each row of the Pattern Map". It is

confusing how step (d) can be repeated at this point in the method, since step (d) is a subsequent

step that has not yet been executed in even a first iteration.

Claim 44, steps (c) and (d) are confusing for several reasons. First, the very first iteration

of step (c) of the method requires replacing the (symbol, position index) pairs of the first

sequence with that of stored patterns. While subsequent iterations of step (c) will still require

replacing the (symbol, position index) pairs of the first sequence, there will be no (symbol,

position index) pairs of the first sequence left to replace since they were already replaced in the

first iteration. Second, upon repeating steps (a) through (c), steps (i) and (ii) of step (a) require

"translating each sequence of symbols" and "for each of two sequences, grouping the (symbol,

position index) pairs by symbol", respectively, yet no mention is made of processing (symbol,

position index) pairs of stored patterns will be necessary when following the requirements of

steps (c) and (d).

The preamble of Claim 45 recites "The method of claim 35, wherein the method of finding all patterns at all levels of support from a set of sequences comprises the steps of". The reference to "the method of finding all patterns at all levels of support" lack antecedent basis, since Claim 35 does is not claimed as a method of finding all patterns at levels of support, nor does it contain such language or such a limitation.

Claim 45, step (a) requires "forming a tree of nodes, where each node corresponds to each possible combination of sequences in an ordered set of sequences, and also therefore to a corresponding k-tuple". The terminology "each possible combination of sequences" is indefinite as to which sequences should or should not be included in each combination. Each possible combination of sequences can simply be the total collection of sequences, in which case every node of the tree would be identical and it would be unclear how the method would produce a meaningful result. Also, the term "forming" is indefinite as to the ordering and connectivity between the nodes of the tree.

Claim 45, step (b) requires "organizing the nodes into a tree structure", which is confusing since the preceding step (a) already required "forming a tree of nodes", so that the nodes are already organized into a tree before execution of step (b), making step (b) redundant in part.

Claim 45, step (b) recites the limitation "the ordered list of sequences". There is insufficient antecedent basis for this limitation in the claim, since the terminology "ordered list of sequences" does not appear previously in the claim, or in Claim 35 from which Claim 45 depends.

Claim 45, step (b) requires organizing the nodes into a tree structure, wherein a node with a k-tuple is connected to all possible nodes containing (k+1) tuples, the (k+1) tuple being formed by adding a unique sequence to the k-tuple, where the sequence being added is later in the ordered list of sequences than the latest sequence of the k-tuple". It is unclear how any (k+1) tuples can be formed by a sequence from the ordered list of sequences, since the preceding step (a) already required that the nodes of the tree correspond to each possible combination of sequences in the ordered set of sequences, and therefore to a corresponding k-tuple. This operation would leave no remaining sequence in the ordered set/list of sequences by which to form a (k+1) tuple in step (b).

Claim 49, step (a) requires "organizing the nodes at level k in the Tuple-tree into a linked list which is ordered from left to right in accordance with the sequence numbers of each tuple". It is unclear how the nodes at level k can ordered in accordance with the sequence numbers of each tuple. More specifically, since each node consists of tuple of multiple sequences, each sequence of which can be numbered, it is unclear which sequence of the multiple sequences would be used to provide a sequence number for the purpose of ordering the node. Furthermore, this step recites the limitation "the sequence numbers of each tuple" which lacks antecedent basis since the terminology does not appear previously, and since there is no preceding step in method in which "sequence numbers of each tuple" were obtained or designated.

Claim 51, step (i) recites the limitation "the sequence numbers of each tuple". This limitation lacks antecedent basis since the terminology does not appear previously, and since there is no preceding step in method in which "sequence numbers of each tuple" were obtained or designated.

Claim 51, step (ii) recites the limitation "indices of the sequences". This limitation lacks

antecedent basis since the terminology does not appear previously, and since there is no

preceding step in method in which "indices of the sequences" were obtained or designated.

Claim 52 recites the limitation "index of a k-tuple". This limitation lacks antecedent

basis since the terminology does not appear previously, and since there is no preceding step in

method in which "index of a k-tuple" was obtained or designated.

Claim 53, step (i) requires "finding a P-node list". It is unclear what a P-node list is since

no definition of a P-node list is disclosed in the instant specification.

Claim 53, step (i) recites the limitation "current T-node pattern array". This limitation

lacks antecedent basis since the terminology does not appear previously, and since there is no

preceding step in method in which a "T-node pattern array" was obtained, created or designated.

Claim 53, step (ii) recites the limitation "the Virtual Sequence Array". This limitation

lacks antecedent basis since the terminology does not appear previously, and since there is no

preceding step in method in which a "Virtual Sequence Array" was obtained, created or

designated.

Claim 53, step (iii) recites the limitation "P-node array". This limitation lacks antecedent

basis since the terminology does not appear previously, and since there is no preceding step in

method in which a "P-node array" was obtained, created or designated.

Claim 66 requires "the data structure grouping...the position (position index) in the first

sequence of each symbol therein". It is not clear how the position indices of the symbols are

grouped, and whether they are grouped only with each other or with some other values.

Furthermore, it is unclear how the method as claimed would result in discovery of patterns in

two sequences since the only recited step is the grouping of position indices.

Claim 67 requires "an indication of the number of symbols in the first sequence". The

term "indication" is indefinite as to the type of designation required, thereby rendering the scope

of the claim uncertain.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

Claims 66 and 67 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Califano (US 5577249 A).

The data structure and its intended use, as in the instant Claims 66 and 67, is considered

to be "non-functional descriptive" material since it cannot be executed to impart a functional

change in a computer. The excerpt immediately below is from M.P.E.P. § 2106(VI) and is

applicable to the 35 U.S.C. § 103 rejection that follows:

> "If the difference between the prior art and the claimed invention is
> limited to descriptive material stored on or employed by a machine, Office
> personnel must determine whether the descriptive material is functional
> descriptive material or nonfunctional descriptive material, as described
> supra in paragraphs IV.B.1(a) and IV. B.1(b). Functional descriptive
> material is a limitation in the claim and must be considered and addressed
> in assessing patentability under 35 U.S.C. 103. Thus, a rejection of the
> claim as a whole under 35 U.S.C. 103 is inappropriate unless the

functional descriptive material would have been suggested by the prior art. In re Dembiczak, 175 F.3d 994, 1000, 50 USPQ2d 1614, 1618 (Fed. Cir. 1999). **Nonfunctional descriptive material cannot render nonobvious an invention that would have otherwise been obvious. Cf. In re Gulack, 703 F.2d 1381, 1385, 217 USPQ 401, 404 (Fed. Cir. 1983) (when descriptive material is not functionally related to the substrate, the descriptive material will not distinguish the invention from the prior art in terms of patentability).** Common situations involving nonfunctional descriptive material are:

- a computer-readable storage medium that differs from the prior art solely with respect to nonfunctional descriptive material, such as music or a literary work, encoded on the medium,

- a computer that differs from the prior art solely with respect to nonfunctional descriptive material that cannot alter how the machine functions (i.e., the descriptive material does not reconfigure the computer), or

- a process that differs from the prior art only with respect to nonfunctional descriptive material that cannot alter how the process steps are to be performed to achieve the utility of the invention. Thus, if the prior art suggests storing a song on a disk, merely choosing a particular song to store on the disk would be presumed to be well within the level of ordinary skill in the art at the time the invention was made. The difference between the prior art and the claimed invention is simply a rearrangement of nonfunctional descriptive material."

All limitations concerning the type of data structure are given no patentable weight as they are considered to be nonfunctional descriptive material. As such, the limitations of Claims 66 and 67 given patentable weight are considered to be limited to any type of computer-readable medium storing any type of data structure.

Califano (US 5577249 A) teaches storing information associated with each sequence tuple as an array "data look-up structure" in a computer "hard disk" (a computer-readable medium) (see col. 9, lines 14-30). Therefore, Califano renders obvious the computer-readable medium containing a data structure of Applicants' Claims 66 and 67.

Made of Record

Prior art of record that discloses some aspects of Applicants' instant invention:

Claverie et al. (Applicants' IDS document, "Heuristic informational analysis of

sequences", *Nucleic Acids Research*, 1986, Vol. 14, No. 1, pages 179-196) teaches a method for

sequence pattern discovery that uses successions of words of length k (k-tuples) appearing in

nucleotide or amino acid sequences for building k-tuple reference tables and word profiles of the

sequences, but does not teach the particular steps of Applicants' instant methods including the

locating of individual symbol locations, computing difference-in-position values, creating master

offset tables, sorting k-tuple tables by difference-in-position values, or forming trees with nodes.

Califano (US 5577249 A) teaches a method of comparing the similarity of sequences of

symbols wherein non-contiguous substrings are appended together to form tuples, indices are

created from the tuples, and the exact locations of the tuples are found within the sequences.

However, Califano does not teach the particular steps of Applicants' instant methods including

the locating of individual symbol locations, computing difference-in-position values, creating

master offset tables, sorting k-tuple tables by difference-in-position values, or forming trees with

nodes.

Contact Information

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Andrew A. Kenedy whose telephone number is (571)-272-0574.

The examiner can normally be reached on Monday-Friday 9:00am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Michael Woodward can be reached on (571)-272-0722. The fax phone number for

the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

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Any inquiry of a general nature or relating to the status of this application or proceeding

should be directed to (571) 272-0547.

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enables applicants to view the scanned images of their own application file folder(s) as well as

general patent information available to the public.

For all other customer support, please call the USPTO Call Center (UCC) at 800-786-

9199.

MARIANNE P. ALLEN
PRIMARY EXAMINER
AU 1631

A.A.K. August 4, 2004